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VOLUME 21, NUMBER 12

EXTENSION SERIES 29

EDITED BY CHARLES H. WILLIAMS

A MANUAL FOR THE MENTAL AND PHYSICAL EXAMINATION OF SCHOOL CHILDREN (Revised)

BY

WILLIAM HENRY PYLE

ISSUED THREE TIMES MONTHLY; ENTERED AS SECOND-CLASS MATTER AT THE POSTOFFICE AT COLUMBIA, MISSOURI—1,000

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FOREWORD

In this new edition of the Manual I have included the results obtained from measuring and testing many thousands more of children. The additional data give the age and sex norms greater reliability. In the tests of city children I have included one additional test, the analogues.

Mr. P. E. Collings, working under my direction, gave the mental tests to all the children above the third grade in the rural schools of one Missouri county. He also took the physical measures of the country children. The results of Mr. Collings' work are included in this manual.

In securing the additional data for city children, I wish to acknowledge the assistance of Miss Hazel Sumerfield, who gave the tests and made the physical measures in the City of Joplin, Missouri.

W. H. P.

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A MANUAL FOR THE MENTAL AND PHYSICAL EXAMINATION OF SCHOOL CHILDREN

(Revised)

OBJECT OF MENTAL TESTS

The object of mental tests is to assist the teacher in obtaining a knowledge of the individual child. Just as a dairyman, to be successful, must know his cows—the best breeds, the best feed, and the best kind of treatment—so a teacher must know her pupils. It is true that she learns about them from their regular work in their classes, but there are various factors besides ability that determine whether a child does well or poorly in school studies. Progress in school studies is not, therefore, an accurate indication of ability. The teacher needs an independent measure of ability. The tests constitute such a measure. A child often does poorly in a particular study because he was started wrong or at the wrong time or is poorly taught. The child may have come to believe, in such a case, that he has no ability in such a study, or perhaps in any study. The tests, being something new, arouse great interest; the child has no preconceived notion about his ability to perform them and is therefore very likely to do his best. A series of mental tests given at the beginning of the school year will give as good an idea of the pupils' ability as can be obtained ordinarily in a year in the ordinary school work. Moreover, the tests show in what aspects of the child's mind he is good and in what aspects, poor. However, too much reliance should not be placed on such differences unless several tests of the same kind are given. If each type of test were repeated about six times and the results of all the tests pooled, they would give an accurate indication of the abilities which the various tests measure. Inasmuch as these abilities are those demanded in school work, the tests give an indication of the child's ability to do the school work. One could not know from the tests whether the child would *do* the school work or not. Doing the school work depends on ability and *effort*. The tests measure only *ability*. They enable us to prophesy success only to the extent that success depends on ability. This is one thing the teacher very much needs to know, the child's ability. The tests, carefully given, will aid very much in determining this ability. Each child is, to some extent, a special problem. We must, therefore, use every means at our command to learn all possible about each child. It requires but an hour and a half to give the mental tests, and only a few days to grade the papers. The information obtained abundantly justifies the time and energy expended.

USE TO BE MADE OF THE RESULTS

The results of the tests will help the teacher in the classification and gradation of the pupils. This help is not much needed except in the doubtful cases. One often needs to know whether a pupil has failed because of lack of effort or lack of ability. The tests will help to answer this question. If a child fails because of lack of ability, he should probably not be promoted. If he fails because of lack of effort, he should probably be promoted and an attempt made to get him to do the work of which he is capable. The progress of children through the grades should be in accordance with *their ability and with the rapidity of their development.* Some children develop much faster than others and can therefore acquire the skill and knowledge of the school subjects much faster than others. The tests will aid in determining the development of the children and should lead to greater economy of time and effort in dealing with them.

An accurate knowledge of the child's ability and development will not only be a help in gradation and classification but should also help in the actual teaching. Every bit of information that a teacher can get about a child should be a help in dealing with that child. Studies made by the author indicate that there is a wide difference of ability possessed by the children ordinarily found in the same grade.. It will usually be found that there are children in the third grade with as great ability as that of some pupils in the high school. A more careful system of gradation will lead to more nearly equal ability in the same grade and should make better teaching possible.

If mental tests were given in a school every year, the development of the child could be traced and the rapidity of this development determined. This information would be a great help in dealing with the individual child. It must be remembered that the mental tests are measures of the abilities possessed by individual children and are not measures of the efficiency of the teacher, except to the extent that the teaching may have affected the development of the child.

PHYSICAL MEASURES AND TESTS

It has been found that there is a close relation between mental and physical development. Therefore, it is important to know of the physical development of every child. If all the children of the same age in the schools are studied, it is found that the heavier ones, the taller ones, the stronger ones, etc., are in the upper grades. Therefore, the physical development of the child should be studied, and the records of this development from year to year kept. Norms of the more important physical measures and tests are given in this manual.

The relation of physical to mental development is shown in the fol-

lowing table, which gives the height and muscular speed of the 12-year-old school children in McDonald County, Missouri. It will be seen that the 12-year-old boys in the higher grades have a better physical development than the boys of the same age in the lower grades.

AVERAGE HEIGHT AND AVERAGE MUSCULAR SPEED, BY GRADES.

Grade	Cases	Av. ht., cm.	Av. musc.sp.
I	4	134	143
II	4	139	151
III	14	145	154
IV	17	146	161
V	39	147	163
VI	13	146	165
VII	18	148	166
VIII	3	149	167

GENERAL DIRECTIONS

The results of the mental tests in the school will be worse than useless unless the tests are given with the greatest care and scientific precision. Every test should be most carefully explained to the children so that they will know *exactly* what they are to do. The matter must be so presented to them that they will put forth *all possible* effort. They must take the tests seriously. Great care must be taken to see that there is no cheating. The work of each child should be his own work. In those tests in which time is an important element, the time must be *carefully kept,* with a stop watch if one is available. The papers should be distributed for the tests and turned face downward on the pupil's desk. The pupil, when all is ready to begin, should take the paper in his hand and at the signal "begin" turn it over and begin work, and when the signal "stop" is given, should quit work instantly and turn the paper over. Before the work begins, the necessary information should be placed on each paper. This information should be the pupil's name, age, grade, sex, and school. This should be on every paper. When the test is over the papers should be immediately collected.

DETERMINATION OF MENTAL AGE

A child's mental age can be determined by combining the results of several tests. For this purpose it will be most convenient to use tables XXXVII and XXXVIII. Find the mental age reached by the child in each test, add these together and divide by the number of tests. It

must be remembered that in all the tables the age indicated is the age at last birthday. The norms in all cases indicate the averages of all children who have passed the birthday indicated by the age who have not yet reach the next birthday. The norm for age ten, for example, represents the standing made by children whose average age is about ten-and-a-half.

LOGICAL MEMORY

OBJECT.—The purpose of this test is to determine the pupil's facility in remembering and reproducing ideas. A pupil's standing in the test may serve as an indication of his ability to remember the subject matter of the school studies.

METHOD.—The procedure in this test is for the teacher to read slowly and distinctly the story to be reproduced. Immediately after the reading the pupils are to write down all of the story that they can recall. They must not begin to write till *after* the reading. Ten minutes should be allowed for the reproduction. This is ample time, and each pupil should be told to use the whole time in working on his reproduction. At the end of ten minutes, collect the papers. Care should be taken to see that each pupil does his own work, that there is no copying. Before reading the story, the teacher should give the following instructions:

> I shall read to you a story entitled *Willie Jones and His Dog* (or *A Farmer's Son,* or *A Costly Temper,* as the case may be). After I have read the story you are to write down all you can remember of it. You are not to use the exact words that I read unless you wish. You are to use your own words. Try to recall as much as possible and write all you recall. Try to get all the details, not merely the main facts.

MATERIAL.—For grades three, four, and five, use *Willie Jones and His Dog;* for grades six, seven, and eight, use *A Farmer's Son;* for the high school, use *A Costly Temper.* The norms for the latter are based on eighth grade and high school pupils.

WILLIE JONES AND HIS DOG

Willie | Jones | was a little | boy | only | five years old. | He had a dog | whose name was Buster. | Buster was a large | dog | with long, | black, | curly | hair. | His fore | feet | and the tip | of his tail | were white. | One day | Willie's mother | sent him | to the store | which was only | a short | distance away. | Buster went with him, | following behind. | As Buster was turning | at the corner, | a car | struck him | and broke | one | hind | leg | and hurt | one | eye. | Willie was | very | sorry | and cried | a long | time. | Willie's father | came | and carried | the poor | dog | home. | The broken leg | got well | in five | weeks | but the eye | that was hurt | became blind. |

A FARMER'S SON

Will | was a farmer's | son | who attended school | in town. | His clothes | were poor and his boots | often smelled | of the farmyard | although he took great | care of them. | Since Will had not gone to school | as much | as his classmates, | he was often | at a disadvantage, | although his mind | was as good | as theirs,— | in fact, he was brighter | than most | of them. | James, | the wit | of the class, | never lost an opportunity | to ridicule | Will's mistakes, | his bright | red | hair, and his patched | clothes. | Will | took the ridicule | in good part | and never | lost his temper. | One Saturday | as Will | was driving | his cows | to pasture, | he met James | teasing | a young | child, | a cripple. | Will's | indignation | was aroused | by the sight. | He asked | the bully | to stop, | but when he would not, | Will pounced | upon him | and gave him | a good | beating, | and he would not | let James go | until he promised | not to tease | the crippled | child | again. |

A COSTLY TEMPER

A man | named John | Murdock | had a servant | who worried him | much by his stupidity. | One day | when this servant was more | stupid | than usual, | the angry | master | of the house | threw a book | at his head. | The servant | ducked | and the book flew | out of the window. |

"Now go | and pick that book up!" | ordered the master. | The servant | started | to obey, | but a passerby | had saved him | the trouble, | and had walked off | with the book. | The scientist | thereupon | began to wonder | what book | he had thrown away, | and to his horror, | discovered | that it was a quaint | and rare | little | volume | of poems, | which he had purchased | in London | for fifty | dollars. |

But his troubles | were not over. | The weeks went by | and the man had almost | forgot his loss, | when strolling | into a second hand | bookshop, | he saw, | to his great delight, | a copy of the book | he had lost. | He asked the price. |

"Well," | said the dealer, | reflectively, | "I guess we can let you have it | for forty | dollars. | It is a very | rare book, | and I am sure | that I could get seventy-five | dollars for it | by holding on a while." |

The man of science | pulled out his purse | and produced the money, | delighted at the opportunity of replacing | his lost | treasure. | When he reached home, | a card | dropped out | of the leaves. | The card was his own, | and further | examination | showed that he had bought back | his own property. |

"Forty dollars | worth of temper," | exclaimed the man. | "I think I shall mend my ways." | His disposition | afterward | became so | good | that | the servant became worried, | thinking the man | must be ill. |

The norms for country children are based upon the *Marble Statue,* which was given in all the grades. The norms for city children based upon this test are not given in this manual, but can be found in the author's *Examination of School Children.*

THE MARBLE STATUE

A young | man | worked | years | to carve | a white | marble | statue | of a beautiful | girl. | She grew prettier | day by day. | He began to love the statue | so well that | one day | he said to it: "I would give | everything | in the world | if you would be alive | and be my wife." | Just then | the clock struck | twelve, | and the cold | stone began to grow warm, | the cheeks red, | the hair brown, | the lips to move. | She stepped down, | and he had his wish. | They lived happily | together | for years, | and three | beautiful | children were born. | One day | he was very tired, | and grew |so angry, | without cause, | that he struck her. | She wept, | kissed | each child | and her husband, | stepped back | upon the pedestal, | and slowly | grew cold, | pale | and stiff, | closed her eyes, | and when the clock | struck | midnight, | she was a statue | of pure | white | marble | as she had been | years before, | and could not hear | the sobs | of her husband | and children. |

THE RESULTS.—The material for the test is divided into units as indicated by the vertical lines. The pupil's written reproduction should be compared unit by unit with the story as printed, and given one credit for each unit adequately reproduced. The norms for the tests are shown in the tables. which follow. In general, it will be noticed, there is an improvement of memory with age, but in the high school, in the *Costly Temper* test, there is a decline. This may not indicate a real decline in ability to remember ideas, but a change in attitude. The high school pupil probably acquires a habit of remembering only significant facts. His memory is selective, while in the earlier ages, the memory may be more parrot-like, one idea being reproduced with about as much fidelity as another. This statement is made not as a *fact,* but as a *probable* explanation.

ROTE MEMORY

OBJECT.—The object of the rote memory tests is to determine the pupil's memory span for unrelated impressions,—words that have no logical relations with one another. Much school work makes demands upon this ability. Therefore, the tests are of importance.

METHOD.—There are two lists of words, *concrete* and *abstract,* with six groups in each list. The list of concrete words should be given first, then the abstract The procedure is to pronounce the first group, *cat, tree, coat,* and then pause for the pupils to write these three words.

Then pronounce the next group, *mule, bird, cart, glass,* and pause for the reproduction, and so on through the list.

Give the following instructions:

> We wish to see how well you can remember words. I shall pronounce first a group of three words. *After* I have pronounced them, you are to write them down. I shall then pronounce a group of four words, then one of five words, and so continue with a longer group each time. You must pay very close attention for I shall pronounce a group but once. You are not required to write the words in their order, but just as you recall them.

MATERIAL.—The words for the test are given in the following lists:

Concrete	*Abstract*
1. Cat, tree, coat	1. good, black, fast
2. mule, bird, cart, glass	2. clean, tall, round, hot
3. star, horse, dress, fence, man	3. long, wet, fierce, white, cold
4. fish, sun, head, door, shoe, block	4. deep, soft, quick, dark, great, dead
5. train, mill, box, desk, oil, pup, bill	5. sad, strong, hard, bright, fine, glad, plain
6. floor, car, pipe, bridge, hand, dirt, cow, crank	6. sharp, late, sour, wide, rough, thick, red, tight

RESULTS.—The papers are graded by determining the number of concrete words and the number of abstract words that are reproduced. No account is taken of whether the words are in the right position or not. A perfect score in each test would therefore be thirty-three. The norms are shown in the tables.

THE SUBSTITUTION TEST

OBJECT.—This test determines one's ability to build up new associations. It is a test of quickness of learning.

METHOD.—The substitution test-sheets are distributed to the pupils and turned face down on the desks. The teacher gives the following instructions:

> We wish to see how fast you can learn. At the top of the sheet which has been distributed to you there is a key. In nine circles are written the nine digits and for each digit there is written a letter which is to be used instead of the digit. Below the key are two columns of numbers; each number contains five digits. In the five squares which follow the number you are to write the letters which correspond to the digits. Work as fast as you can and fill as many of the squares as you can without making mistakes. When I say "stop," quit work instantly and turn the paper over.

Before beginning the test the teacher should explain on the blackboard the exact nature of the test. This can be done by using other let-

ters instead of those used in the key. Make sure that the pupils understand what they are to do. Allow *eight* minutes in grades three, four, and five, and *five* minutes above the fifth grade.

MATERIAL.—For material use the substitution test-sheets.

RESULTS.—In grading the work, count each square correctly filled in as one point, and reduce the score to speed per minute by dividing by eight in grades three, four, and five, and by five in the grades above.

FREE ASSOCIATION

OBJECT.—This test determines the speed of the free flow of ideas. The result of the test is a criterion of the quickness of the flow of ideas when no restriction or limitation is put on this flow.

METHOD.—The procedure in this test is to give the pupils a word, and tell them to write this word down and all the other words that come into their minds. Make it clear to them that they are to write whatever word comes to mind, whether it has any relation to the word that is given them or not. Start them with the word *cloud*. Give the following instructions:

> I wish to see how many words you can think of and write down in three minutes. I shall name a word, you may write it down and then all the other words that come into your mind. Do not write sentences, merely the words that come into your mind. Work as fast as you can.

RESULTS.—Score the work by counting the number of words that have been written.

OPPOSITES

OBJECT.—This is a test of controlled association. It tests one aspect of the association of ideas. All thinking is a matter of association of ideas. Reasoning is controlled association. The test may therefore be taken as a measure of speed in reasoning.

METHOD.—Distribute the opposites lists to the pupils and turn them face down on the desks. Use list *one* in grades three, four, and five, and list *two* in grades above. Allow two minutes in grades three, four, and five and one minute in grades above. Give the following instructions:

> On the sheets that have been distributed to you are fifty words. After each word you are to write a word that has the opposite meaning. For example, if one word were *far*, you could write *near*. Work as fast as you can, and when I say "stop," quit work instantly and turn your paper over.

RESULTS.—The score is the number of opposites correctly written.

OPPOSITES—List No. I.

1. good
2. big
3. rich
4. out
5. sick
6. hot
7. long
8. wet
9. yes
10. high
11. hard
12. sweet
13. clean
14. sharp
15. fast
16. black
17. old
18. up
19. thick
20. quick
21. pretty
22. heavy
23. late
24. wrong
25. smooth
26. strong
27. dark
28. dead
29. wide
30. empty
31. above
32. north
33. laugh
34. man
35. before
36. winter
37. ripe
38. night
39. open
40. first
41. over
42. love
43. come
44. east
45. top
46. wise
47. front
48. girl
49. sad
50. fat

OPPOSITES—List No. II.

1. strong
2. deep
3. lazy
4. seldom
5. thin
6. soft
7. many
8. valuable
9. gloomy
10. rude
11. dark
12. rough
13. pretty
14. high
15. foolish
16. present
17. glad
18. strange
19. wrong
20. quickly
21. black
22. good
23. fast
24. clean
25. tall
26. hot
27. long
28. wet
29. fierce
30. great
31. dead
32. cloudy
33. hard
34. bright
35. fine
36. plain
37. sharp
38. late
39. sour
40. wide
41. drunk
42. tight
43. empty
44. sick
45. friend
46. above
47. loud
48. war
49. in
50. yes

THE WORD BUILDING TEST

OBJECT.—This is a test of a certain type of inventiveness, namely linguistic invention. Specifically it tests the pupil's ability to construct words using certain prescribed letters.

METHODS.—The pupils are given the letters, a, e, o, m, n, r, and told to make as many words as possible using only these letters. Give the following instructions:

> I wish to see how many words you can make in five minutes, using only the letters which I give you. The words must be real English words. You must use only the letters which I give you and must not use the same letter more than once in the same word. You do not, of course, have to use all the letters in the same word. A word may contain one or more letters up to six.

MATERIAL.—The pupils need only sheets of blank paper.

RESULTS.—The score is the number of words that do not violate the rules of the test as given in the instructions.

THE COMPLETION TEST

OBJECT.—This test, to some extent, is a test of reasoning capacity. Of course, it is only one particular aspect of reasoning. The pupil is given a story that has certain words omitted. He must read the story, see what it is trying to say and determine what words, put into the blanks, will make the correct sense. The meaning of the word written in a particular blank must not only make the sentence read sensibly but must fit into the story *as a whole.* Filling in the blanks in this way demands considerable thought.

METHOD.—Distribute the test-sheets and turn them face down on the desks. Allow ten minutes in all the tests. Give the following instructions:

> On the sheets which have been distributed is printed a story, which has certain words omitted. You are to put in the blanks the words that are omitted. The words, which you write in, must give the proper meaning so that the story reads correctly. The word, which you fill in, must not only give the proper meaning to the sentence but to the story as a whole.

MATERIAL.—Use the completion test-sheets, *Joe and the Fourth of July,* for grades three, four and five; *The Trout* for grades six, seven and eight; and *Dr. Goldsmith's Medicine* for the high school.

RESULTS.—In scoring the papers, allow one credit for each blank correctly filled. It will be noticed that the boys excel in the Trout story. This is doubtless because the story is better suited to them on the ground of their experience and interest.

JOE AND THE FOURTH OF JULY

Joe *ran* errands for *his* mother and *took* care of the *baby* until by the Fourth of July his penny *grew* to be a dime. The day before the Fourth, he *went* down town all by *himself* to get his fire *works.* There were so *many* kinds he hardly knew which to *buy.* The clerk knew that it takes a *long* time to decide, for he had been a *boy* himself not very *long* ago. So he helped Joe to *select* the very best kinds. "When are you going to *fire* them off?" asked the clerk. "I will fire *them* very *early* tomorrow," said the boy. So that night Joe set the *alarm* clock, and the next *morning* got up *early* to fire his firecrackers.

THE TROUT

The trout is a fine fish. Once a big trout *lived* in a pool *close* by a spring. He used to *stay* under the bank with *only* his head show-

ing. His wide-open *eyes* shone like jewels. I tried to *catch* him. I would *creep* up to the *edge* of the pool *where* I could see his *bright* eyes looking up.

I *caught* a grasshopper and *threw* it over *to* him. Then there was a *splash* in the water and the grasshopper *was gone.* I *did* this *two* or three times. Each time I *saw* the rush and spl *ash* and saw the bait had been *taken.*

So I put the sa *me* bait on my *hook* and *threw* it over into the *water.* But *all* was silent. The fish was an *old* one and had *grown* very wise. I did this *day* after day with the same luck. The trout *knew* there was a *hook* hidden in the bait.

DOCTOR GOLDSMITH'S MEDICINE

This *is* a story *of* good medicine. Most medicine is *bad* to take, but this was so good *that* the sick man *wished* for more.

One day a poor woman *went* to Doctor Goldsmith and *asked* him to *go* to see her *sick* husband. "He *is* very sick," she said, "and I *can* not *get* him to eat anything."

So Doctor Goldsmith *went* to *see* him. The doctor *saw* at once that the *reason* why the man *could* not eat was *because* he was *so* poor that he had *not* been *able* to buy good food.

Then he *said* to the woman, " *Come* to my *house* this evening and I will *give you* some *medicine* for your *husband.*

The women *went* in the evening and the *doctor* gave *her* a small paper box tied *up* tight. " *It* is very heavy," *she* said. "May I *see* what it looks *like*?" "*No*," said the doctor, " *wait* until you get *home.*" When she *got* home, and she and *her* husband *opened* the box so that he *could* take the first *dose* of medicine,—what do you think they *saw*? The box was *filled* with silver *money. This* was the *good* doctor's medicine.

ANALOGUES

OBJECT.—This is a test of one's ability to see logical relationships. It measures ability similar to that measured by the Opposites test, also similar to that measured by the Completion test.

METHOD.—Distribute the test sheets and turn them face down on the desks. Read the samples at the top of the test sheet and let the pupills orally supply the fourth term. The replies will give the examiner an idea as to how well the test is understood. When you are sure that all understand, say:

> When I give the signal you may turn over the test sheet. You will find twenty-five analogies, each with the fourth term omitted. In the blank space you are to supply the fourth term, which must have the same relation to the third term that the second term does to the first.
>
> Give one minute and forty-five seconds in all grades.

ANALOGUES

	Cold	is to	Hot	as	Black	is to White
	Stairs	is to	Step	as	Ladder	is to Rung
	Conductor	is to	Train	as	Captain	is to Boat
	Hand	is to	Finger	as	Foot	is to Toe
	Baby	is to	Man	as	Lamb	is to Sheep
1.	Ring	is to	Finger	as	Bracelet	is to .....
2.	Bird	is to	Wing	as	Fish	is to .....
3.	Coal	is to	Stove	as	Oil	is to .....
4.	Arm	is to	Elbow	as	Leg	is to .....
5.	Fish	is to	Scales	as	Bird	is to .....
6.	Time	is to	Clock	as	Temperature	is to .....
7.	Water	is to	Gallon	as	Wheat	is to .....
8.	Table	is to	Wood	as	Coat	is to .....
9.	Purse	is to	Money	as	Bucket	is to .....
10.	Water	is to	Boat	as	Air	is to .....
11.	Storm	is to	Calm	as	War	is to .....
12.	Shoe	is to	Foot	as	Glove	is to .....
13.	Man	is to	Home	as	Bird	is to .....
14.	Dog	is to	Bark	as	Cat	is to .....
15.	Day	is to	Sun	as	Night	is to .....
16.	Horse	is to	Buggy	as	Engine	is to .....
17.	Apple	is to	Tree	as	Tomato	is to .....
18.	Chicken	is to	Coop	as	Horse	is to .....
19.	Kitten	is to	Cat	as	Gosling	is to .....
20.	Pie	is to	Pan	as	Coffee	is to .....
21.	Sweet	is to	Sugar	as	Sour	is to .....
22.	Coal	is to	Black	as	Chalk	is to .....
23.	Silk	is to	Silkworm	as	Wool	is to .....
24.	Sheep	is to	Flock	as	Cow	is to .....
25.	Uncle	is to	Nephew	as	Aunt	is to .....

THE PHYSICAL TESTS AND MEASURES

OBJECT.—The object of the physical tests is to determine the physical development of the pupils.

METHOD AND MATERIAL.—For accurately measuring height a stadiometer is needed. Great care should be exercised in making the measurements. If the pupils are measured standing with their shoes on, the height of the heel should be deducted. The heel of the shoe can be accurately measured by means of callipers.

For weight, accurate platform scales are needed. For testing strength use the Smedley dynamometer, and give three trials with each hand, recording the best result for each. For testing muscular speed, use tapping

apparatus and electric counter, making a thirty seconds test with the right hand and then a thirty seconds test with the left hand. Before beginning the test, demonstrate to the pupil how it is to be done and allow him to try a second or two to see that he holds the stylus properly. The stylus should be held vertically and the pupil should strike the plate lightly.

The lung capacity test is made by means of a wet spirometer. The pupil is urged to fill the lungs as full as possible and then expel all the air into the spirometer. Give three trials and record the best result. The vital index is determined by dividing the lung capacity by the weight. Owing to the importance to the body of the aeration of the blood, the vital index is an important measure. Moreover, since the index is the ratio of the lung capacity to the weight, it has a value that the other physical measures do not have. When we have measured a child's weight or height, we can make no inferences unless we know whether the child belongs to a long stock or a short stock, a heavy stock or a light stock. But, when we have determined the amount of air-space in the lungs per pound of weight of the child, we have a measure that is of direct and special significance. The norms are shown in the tables. A more complete description of these tests and other tables of norms may be found in the author's *Examination of School Children,* or in Whipple's *Manual of Mental and Physical Tests.*

MATERIAL AND APPARATUS

Test sheets for the mental tests can be obtained from the Extension Division of the University of Missouri. Apparatus for the physical tests can be obtained from C. H. Stoelting Company, Chicago.

TABLES

Tables I to XII contain the age and sex norms for the physical measures for both city and country children. In XIII and XIV city and country children are compared in physical development. In tables XV to XXXVI are found the norms for the mental tests. Tables XXXVII and XXXVIII are comparative tables for mental measures. Table XXXIX gives the mental norms for city children by grades.

INTERPRETATION OF THE RESULTS

The children measured are in all cases selected groups: namely, children in the public schools. For the physical measures, at least up to age fourteen, the norms are doubtless fairly representative of the general population. At age fourteen the children begin to drop out of school.

The figures seem to indicate that those who drop out have somewhat better physical development, on the average, than those that remain, for in many cases in the later years the averages are lowered.

The mental measures are still further complicated by the fact that in the Logical Memory, Opposites, and Completion tests, different tests are used for different grades. In such cases, the norms for the earlier ages are too high and those for the later ages are too low, for in any grade the youngest children are bright for their age and the oldest ones are dull for their age. However, if these facts are borne in mind, there need be no confusion in interpreting the results. It is probable that if there were no complicating factors the norm for any age would in no case be lower than that of the preceding age.

It will be noticed that in the physical measures there is little difference between city and country children, but a great difference in the mental measures, city children being much better. This difference decreases in the later ages. A comparison of the mental development of the sexes shows that in nearly all tests and at nearly all ages the girls are better than the boys. The rate of mental growth especially from age nine to twelve is greater for girls than it is for boys, just as their physical growth during these years is greater than that of boys. In order to have in the same grade children of the same ability, it would be necessary to have boys averaging several months older than the girls.

TABLE I—STANDING HEIGHT, CITY CHILDREN

	Boys			Girls		
Age	Number cases	Average Cm	Average Inches	Number cases	Average Cm	Average Inches
6	260	115.3	45.4	235	115.8	45.6
7	287	120.0	47.2	287	119.9	47.2
8	348	127.0	50.0	314	124.5	49.0
9	281	133.4	52.5	321	132.3	52.1
10	317	136.1	53.6	304	135.6	53.4
11	349	140.2	55.2	291	141.2	55.6
12	295	146.8	57.8	294	148.3	58.4
13	304	150.1	59.1	326	152.4	60.0
14	231	155.4	61.2	263	156.5	61.6
15	181	163.1	64.2	233	158.0	62.2
16	125	166.6	65.6	197	161.3	63.5
17	70	171.2	67.4	119	160.3	63.1
18	50	172.0	67.7	71	160.3	63.1

TABLE II—STANDING HEIGHT, COUNTRY CHILDREN

	Boys			Girls		
Age	Number cases	Average Cm	Average Inches	Number cases	Average Cm	Average Inches
8	128	126.3	49.8	147	125.5	49.4
9	108	130.3	51.3	115	126.1	49.7
10	121	134.5	53.0	130	137.0	54.0
11	105	139.5	55.0	106	139.7	55.0
12	114	144.2	56.8	117	147.5	58.1
13	74	148.7	58.6	116	152.3	60.0
14	88	155.4	61.2	93	156.3	61.6
15	51	163.5	64.4	79	159.9	63.0
16	66	163.3	64.3	53	163.3	64.3
17	44	163.2	64.3	62	160.4	63.2
18	36	176.1	69.4	81	163.1	64.3

TABLE III—SITTING HEIGHT, CITY CHILDREN

	Boys			Girls		
Age	Number cases	Average Cm	Average Inches	Number cases	Average Cm	Average Inches
6	260	62.0	24.4	235	62.5	24.6
7	288	63.5	25.0	286	63.8	25.1
8	348	67.1	26.4	314	65.5	25.8
9	280	69.6	27.4	321	68.1	26.8
10	317	70.6	27.8	304	69.9	27.5
11	347	72.6	28.6	291	72.9	28.7
12	295	75.4	29.7	294	76.7	30.2
13	304	76.5	30.1	327	79.0	31.1
14	226	79.8	31.4	256	81.0	31.9
15	165	83.8	33.0	216	82.6	32.5
16	117	86.4	34.0	185	84.1	33.1
17	69	89.2	35.1	111	84.1	33.1
18	41	88.6	34.9	68	83.8	33.0

TABLE IV—SITTING HEIGHT, COUNTRY CHILDREN

	Boys			Girls		
Age	Number cases	Average Cm	Average Inches	Number cases	Average Cm	Average Inches
8	127	67.8	26.7	147	66.3	26.1
9	108	68.5	27.0	115	66.4	26.2
10	121	70.4	27.7	130	70.4	27.7
11	105	71.6	28.2	106	71.7	28.2
12	114	73.3	28.9	117	75.1	29.6
13	74	75.6	29.8	116	77.4	30.5
14	88	78.3	30.9	93	80.5	31.7
15	51	81.9	32.3	79	81.5	32.1
16	66	82.1	32.3	53	82.2	32.4
17	44	87.4	34.4	62	83.5	32.9
18	36	89.7	35.3	81	83.9	33.1

TABLE V—WEIGHT, CITY CHILDREN

	Boys			Girls		
Age	Number cases	Average Kg	Average Lbs	Number cases	Average Kg	Average Lbs
6	261	20.9	46.0	240	20.2	44.4
7	288	23.0	50.6	285	22.4	49.4
8	349	25.8	56.8	314	25.4	55.9
9	290	27.9	61.4	320	27.7	61.0
10	331	31.4	69.2	315	30.5	67.1
11	361	34.7	76.4	313	34.2	75.3
12	313	37.6	82.9	317	39.5	86.9
13	320	41.7	91.8	330	44.4	97.7
14	254	47.7	104.3	281	48.7	107.2
15	210	54.4	119.9	246	50.9	112.1
16	138	57.7	127.3	210	53.1	117.0
17	79	62.5	137.7	114	56.0	123.4
18	52	64.2	141.3	81	55.3	121.7

TABLE VI—WEIGHT, COUNTRY CHILDREN

Age	Boys			Girls		
	Number cases	Average lbs.	Average Kg.	Number cases	Average lbs.	Average Kg.
8	127	57.6	26.2	147	52.9	24.0
9	108	61.0	27.7	115	58.5	26.6
10	121	67.3	30.6	139	65.9	29.9
11	105	72.0	32.7	106	73.6	33.4
12	114	79.2	36.0	117	86.1	39.1
13	74	85.1	38.6	116	94.1	42.7
14	88	99.0	44.9	93	103.8	47.1
15	51	113.6	51.6	79	117.3	53.3
16	66	128.0	58.1	53	118.6	53.8
17	44	130.6	59.3	62	115.0	52.2
18	36	144.0	65.4	81	120.4	54.7

TABLE VII—LUNG CAPACITY AND VITAL INDEX, CITY CHILDREN

Boys

Age	Number cases	Cc.	Cu. Inches	Cc per Kg.	Cu. Inches per lb.
6	270	1170	71.4	56.0	1.55
7	295	1262	77.0	54.9	1.52
8	355	1453	88.6	56.3	1.56
9	296	1582	96.5	56.7	1.57
10	326	1826	111.4	58.2	1.61
11	365	1981	120.8	57.1	1.59
12	315	2172	132.5	57.8	1.60
13	321	2384	145.4	57.2	1.58
14	251	2712	165.4	56.9	1.59
15	207	3189	194.6	58.6	1.62
16	140	3448	210.3	59.8	1.65
17	78	3781	230.6	60.5	1.69
18	62	3855	235.0	60.0	1.66

Girls

Age	Number cases	Cc.	Cu. Inches	Cc per Kg.	Cu. Inches per lb.
6	249	981	59.8	48.5	1.35
7	292	1143	69.7	51.0	1.41
8	316	1303	79.5	51.3	1.42
9	318	1440	87.8	52.0	1.44
10	314	1601	97.7	52.5	1.45
11	318	1829	111.6	53.5	1.48
12	334	2032	124.0	51.4	1.43
13	351	2252	137.4	50.7	1.41
14	287	2441	148.9	50.1	1.39
15	253	2476	151.0	48.6	1.35
16	214	2598	158.5	48.9	1.35
17	129	2614	159.5	46.7	1.29
18	80	2588	157.9	46.8	1.30

TABLE VIII—LUNG CAPACITY AND VITAL INDEX, COUNTRY CHILDREN

Boys

Age	Number cases	Cc.	Cu. Inches	Cc per Kg.	Cu. Inches per lb.
8	127	1439	87.8	54.9	1.52
9	108	1654	100.9	59.7	1.65
10	121	1781	108.6	58.2	1.61
11	105	1997	121.8	61.1	1.61
12	114	2105	128.4	58.5	1.62
13	74	2344	143.0	60.1	1.68
14	88	2719	165.9	60.5	1.66
15	51	3255	198.6	63.1	1.74
16	66	3257	198.7	56.1	1.55
17	44	3801	231.9	64.1	1.77
18	36	4496	274.3	68.8	1.90

Girls

Age	Number cases	Cc.	Cu. Inches	Cc per Kg.	Cu. Inches per lb.
8	147	1274	77.7	53.1	1.47
9	115	1427	87.0	53.7	1.49
10	130	1617	98.6	54.1	1.50
11	106	1856	113.2	55.6	1.54
12	117	2002	122.7	51.2	1.43
13	116	2231	136.1	52.2	1.45
14	93	2478	151.2	52.6	1.46
15	79	2583	157.6	48.5	1.34
16	53	2788	170.0	51.8	1.43
17	62	2805	171.1	53.7	1.49
18	81	2833	172.8	51.8	1.44

TABLE IX—GRIP IN KG., CITY CHILDREN

Age	Boys			Girls		
	Number cases	Right hand	Left hand	Number cases	Right hand	Left hand
6	267	10.4	9.7	247	9.0	8.9
7	298	12.6	11.6	289	10.7	10.5
8	351	14.9	13.5	311	12.5	11.4
9	299	16.9	15.4	320	14.6	14.4
10	332	19.4	17.8	322	16.3	15.1
11	372	21.6	19.9	320	18.4	16.9
12	321	24.0	21.9	334	21.7	20.3
13	316	27.2	25.1	343	24.9	22.9
14	258	31.2	28.4	285	26.9	24.4
15	209	36.6	32.7	255	28.3	25.5
16	139	41.0	38.0	215	28.7	26.8
17	82	45.3	42.9	129	28.8	28.1
18	65	45.3	42.9	81	28.8	26.6

TABLE X—GRIP IN KG., COUNTRY CHILDREN

Age	Boys			Girls		
	Number cases	Right hand	Left hand	Number cases	Right hand	Left hand
8	127	14.3	13.1	147	12.5	11.4
9	108	16.4	15.2	115	14.3	13.1
10	121	17.6	16.4	130	15.6	14.9
11	106	19.6	18.2	106	17.4	16.3
12	114	21.8	20.5	117	21.0	19.6
13	74	23.9	22.5	116	21.9	22.2
14	88	28.3	26.3	93	25.3	24.3
15	51	32.6	31.3	79	28.4	26.8
16	66	40.5	37.9	53	29.5	27.9
17	44	42.0	40.0	62	30.7	28.4
18	36	50.5	46.3	81	31.5	29.2

TABLE XI—MUSCULAR SPEED, CITY CHILDREN

Number of taps in thirty seconds.

Age	Boys			Girls		
	Number cases	Right hand	Left hand	Number cases	Right hand	Left hand
6	268	112	100	249	112	99
7	294	120	104	292	124	104
8	353	131	111	315	129	111
9	296	137	118	315	138	119
10	320	148	126	310	146	126
11	361	155	132	314	155	133
12	316	161	138	327	162	142
13	319	172	146	347	168	147
14	248	172	150	275	172	151
15	206	183	160	251	174	153
16	140	186	164	212	181	160
17	79	195	173	138	184	166
18	61	206	176	82	185	167

TABLE XII—MUSCULAR SPEED, COUNTRY CHILDREN

Number of taps in thirty seconds.

Age	Boys			Girls		
	Number cases	Right hand	Left hand	Number cases	Right hand	Left hand
8	127	135	111	147	136	115
9	108	144	117	115	139	118
10	122	149	123	130	148	126
11	106	155	133	106	154	131
12	114	160	133	117	158	138
13	74	163	137	116	165	142
14	88	173	147	93	172	148
15	51	177	147	79	177	156
16	66	185	158	53	181	157
17	44	163	160	62	184	163
18	36	195	167	81	190	168

TABLE XIII—COMPARATIVE TABLE, CITY AND COUNTRY BOYS

Physical Measures

	Age	6	7	8	9	10	11	12	13	14	15	16	17	18	
St. Ht.	City	45.4	47.2	50.0	52.5	53.6	55.2	57.8	59.1	61.2	64.2	65.6	67.4	67.7	Inches
	Coun			49.8	51.3	53.0	55.0	56.8	58.6	61.2	64.4	64.3	64.3	69.4	
Si. Ht.	City	24.4	25.0	26.4	27.4	27.8	28.6	29.7	30.1	31.4	33.0	34.0	35.1	34.9	Inches
	Coun			26.7	27.0	27.7	28.2	28.9	29.8	30.9	32.3	32.3	34.4	33.3	
Wt.	City	20.9	23.0	25.8	27.9	31.4	34.7	37.6	41.7	47.7	54.4	57.7	62.5	64.2	Kg.
	Coun			26.2	27.7	30.6	32.7	36.0	38.6	44.9	51.6	58.1	59.3	65.4	
Lung Capy.	City	71	77	89	97	111	121	133	145	165	195	210	231	235	Cu. Inches
	Coun			88	101	109	122	128	143	166	199	199	232	274	
Vital Index	City	1.55	1.52	1.56	1.57	1.61	1.59	1.60	1.58	1.59	1.62	1.68	1.69	1.66	Cu. In. Per Lb.
	Coun			1.52	1.65	1.61	1.61	1.62	1.68	1.66	1.74	1.55	1.77	1.90	
Grip Rt.Hd.	City	10.4	12.6	14.9	16.9	19.4	21.6	24.0	27.2	31.2	36.6	41.0	45.3	45.3	Kg.
	Coun			14.3	16.4	17.6	19.6	21.8	23.9	28.3	32.6	40.5	42.0	50.5	
Speed Rt.Hd.	City	112	120	131	137	148	155	161	172	172	183	186	195	206	Taps per 30 Sec.
	Coun			135	144	149	155	160	163	173	177	185	163	195	

For convenience in the above table, lung capacity is expressed in cubic inches and vital index in cubic inches per pound.

TABLE XIV—COMPARATIVE TABLE, CITY AND COUNTRY GIRLS

Physical Measures

	Age	6	7	8	9	10	11	12	13	14	15	16	17	18	
St. Ht.	City	45.6	47.2	49.0	52.1	53.4	55.9	58.4	60.0	61.6	62.2	63.5	63.1	63.1	Inches
	Coun			49.4	49.7	54.0	55.0	58.1	60.0	61.6	63.0	64.3	63.2	64.3	
Si. Ht.	City	24.6	25.1	25.8	26.8	27.5	28.7	30.2	31.1	31.9	32.5	33.1	33.1	33.0	Inches
	Coun			26.1	26.2	27.7	28.2	29.6	30.5	31.7	32.1	32.4	32.9	33.1	
Wt.	City	20.2	22.4	25.4	27.7	30.5	34.2	39.5	44.4	48.7	50.9	53.1	56.0	55.3	Kg.
	Coun			24.0	26.6	29.9	33.4	39.1	42.7	47.1	53.3	53.8	52.2	54.7	
Lung Capy.	City	60	70	80	88	98	112	124	137	149	151	159	160	158	Cu. Inches
	Coun			88	101	109	122	128	143	166	199	199	232	274	
Vital Index	City	1.35	1.41	1.42	1.44	1.45	1.48	1.43	1.41	1.39	1.35	1.35	1.29	1.30	Cu. In. Per Lb.
	Coun			1.47	1.49	1.50	1.54	1.43	1.45	1.46	1.34	1.43	1.49	1.44	
Grip Rt.Hd.	City	9.0	10.7	12.5	14.6	16.3	18.4	21.7	24.9	26.9	28.3	28.7	28.8	28.8	Kg.
	Coun			12.5	14.3	15.6	17.4	21.0	21.9	25.3	28.4	29.5	30.7	31.5	
Speed Rt.Hd.	City	112	124	129	138	146	155	162	168	172	174	181	184	185	Taps per 30 Sec.
	Coun			136	139	148	154	158	165	172	177	181	184	190	

TABLE XV—ROTE MEMORY, CONCRETE, CITY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cascs	Average
8	176	17.46	172	18.59
9	249	19.77	297	19.76
10	348	20.82	321	20.94
11	376	22.03	330	22.81
12	346	23.30	347	24.22
13	339	24.12	358	24.69
14	266	24.83	304	24.97
15	277	25.40	247	25.78
16	155	25.66	183	26.96
17	76	26.72	121	27.28
18	46	27.15	64	27.52

TABLE XVI—ROTE MEMORY, ABSTRACT, CITY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
8	174	15.70	172	17.19
9	255	18.01	297	18.49
10	349	19.25	319	19.66
11	375	20.02	330	21.05
12	348	21.22	350	22.56
13	339	22.14	359	23.35
14	267	23.16	303	23.66
15	228	23.87	248	24.64
16	155	24.13	181	25.71
17	77	25.74	121	25.88
18	46	26.44	64	27.13

TABLE XVII—OPPOSITES, LIST I, CITY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
8	175	10.85	167	11.38
9	233	13.42	287	14.59
10	265	16.70	287	17.74
11	216	16.69	173	17.76
12	97	17.26	75	18.36

TABLE XVIII—OPPOSITES, LIST II, CITY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
10	81	8.31	70	7.44
11	180	8.74	183	8.50
12	250	9.37	301	10.13
13	293	10.19	349	11.05
14	243	11.28	292	12.28
15	213	13.10	224	14.64
16	134	14.12	179	16.69
17	62	15.55	98	19.29
18	39	15.34	57	17.77

TABLE XIX—LOGICAL MEMORY, *WILLIE JONES*, CITY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
8	235	25.14	222	27.31
9	320	27.83	371	29.21
10	379	29.98	133	32.31
11	275	31.56	143	31.69
12	138	31.04	101	34.10
13	81	31.38	49	33.48

TABLE XX—LOGICAL MEMORY, *FARMER'S SON*, CITY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
10	102	30.86	302	31.77
11	208	32.64	262	32.48
12	274	32.09	345	31.51
13	275	33.65	329	32.99
14	168	32.91	199	32.73
15	84	32.80	66	32.52

TABLE XXI—LOGICAL MEMORY, *COSTLY TEMPER*, CITY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
13	88	50.41	109	53.23
14	130	50.66	146	51.51
15	191	49.23	214	50.54
16	142	48.91	207	51.37
17	92	47.17	140	49.64
18	54	47.24	73	49.62

TABLE XXII—WORD-BUILDING, CITY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
8	172	5.74	182	5.73
9	249	6.02	295	6.69
10	339	7.49	321	7.80
11	365	8.41	322	9.01
12	339	9.28	336	10.38
13	318	10.53	355	11.82
14	249	11.42	287	12.82
15	193	12.62	212	14.29
16	138	14.21	167	15.30
17	70	15.27	102	17.12
18	30	15.31	57	17.49

TABLE XXIII—FREE ASSOCIATION, CITY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
8	186	21.51	186	24.50
9	264	25.29	316	28.92
10	366	31.21	337	35.45
11	384	34.77	352	40.39
12	359	38.96	376	45.07
13	346	42.91	377	49.74
14	264	46.58	309	53.56
15	222	51.70	236	54.49
16	150	53.57	182	59.12
17	87	53.74	115	59.59
18	40	52.79	66	58.27

TABLE XXIV—SUBSTITUTION, CITY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
8	223	7.95	213	9.11
9	296	10.08	355	10.86
10	410	11.81	386	13.82
11	443	13.43	387	15.88
12	399	15.48	433	18.29
13	401	16.80	424	20.31
14	308	19.26	344	22.21
15	255	22.13	274	24.17
16	173	23.71	217	26.92
17	93	26.42	141	28.12
18	52	24.41	86	28.39

TABLE XXV—COMPLETION TEST, CITY CHILDREN

Joe and the Fourth of July

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
8	243	10.6	233	11.8
9	326	12.1	385	13.0
10	363	13.7	141	14.5
11	270	13.5	149	15.1
12	121	13.2	101	14.2
13	72	13.1	41	15.3

TABLE XXVI—COMPLETION TEST, CITY CHILDREN

The Trout

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
10	103	15.7	306	14.6
11	223	17.1	267	15.4
12	262	16.6	329	16.4
13	260	18.1	282	20.0
14	169	18.0	216	18.5
15	92	18.4	81	19.2

TABLE XXVII—COMPLETION TEST, CITY CHILDREN
Dr. Goldsmith's Medicine

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
13	73	41.1	69	42.4
14	120	38.6	125	43.8
15	169	39.4	197	42.9
16	129	40.2	199	43.6
17	82	42.4	130	44.1
18	50	41.1	74	44.6

TABLE XXVIII—ANALOGUES, CITY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
8	120	1.3	120	1.7
9	167	2.6	282	2.3
10	246	4.6	244	4.3
11	281	4.9	244	5.9
12	242	6.5	248	7.8
13	238	8.4	244	10.2
14	192	9.4	227	10.1
15	134	10.3	161	11.2
16	98	11.7	119	12.8
17	39	15.3	73	12.9
18	14	13.8	36	14.6

TABLE XXIX—LOGICAL MEMORY, COUNTRY CHILDREN
The Marble Statue

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
8	70	5.1	115	5.9
9	123	8.9	89	8.1
10	177	11.4	146	11.2
11	199	13.9	116	17.0
12	141	17.6	186	20.4
13	180	17.7	110	24.7
14	88	20.0	140	28.7
15	72	24.3	80	29.6
16	30	22.4	30	34 3
17	33	28.2	31	32.5
18	21	29.8	23	37.2

TABLE XXX—COMPLETION, COUNTRY CHILDREN

Joe and the Fourth of July

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
8	110	4.4	122	5.3
9	101	5.5	81	5.3
10	112	6.9	124	6.9
11	125	8.0	112	9.9
12	121	8.4	111	10.3

TABLE XXXI—FREE ASSOCIATION, COUNTRY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
8	151	16.5	152	21.2
9	152	17.3	120	22.1
10	152	23.6	172	27.1
11	148	30.0	171	32.2
12	120	30.5	164	36.6
13	136	35.0	156	34.0
14	136	32.8	128	36.4
15	112	34.3	124	36.2
16	84	36.0	64	46.4
17	21	35.5	34	45.6
18	24	39.9	37	42.9

TABLE XXXII—OPPOSITES LIST NO. I, COUNTRY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
8	110	4.9	102	6.2
9	98	6.4	122	6.9
10	130	8.2	159	7.4
11	142	9.9	140	9.0
12	122	9.8	123	13.1

TABLE XXXIII—OPPOSITES LIST NO. II, COUNTRY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
10	126	5.1	149	5.4
11	140	5.7	130	5.6
12	112	5.6	144	7.2
13	146	6.8	112	7.2
14	112	7.1	130	8.8
15	86	7.2	82	10.3
16	56	9.8	33	11.6
17	30	10.5	30	12.9
18	29	11.0	29	12.5

TABLE XXXIV—SUBSTITUTION, COUNTRY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
8	113	6.0	134	7.1
9	117	7.7	101	8.4
10	130	9.2	152	11.9
11	150	12.4	141	15.2
12	125	14.6	138	19.8
13	106	17.3	154	21.9
14	112	19.8	124	23.5
15	80	20.5	92	24.8
16	52	21.2	50	27.6
17	17	22.4	30	28.6
18	28	25.5	30	28.3

TABLE XXXV—ROTE MEMORY, CONCRETE, COUNTRY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
8	120	13.4	138	14.5
9	120	14.8	98	16.5
10	146	18.3	150	18.2
11	124	21.0	138	21.5
12	108	21.8	128	22.7
13	122	22.2	118	25.7
14	104	22.4	130	26.2
15	74	24.6	94	27.5
16	54	24.4	52	26.8
17	30	26.5	23	27.7
18	25	25.8	32	27.3

TABLE XXXVI—ROTE MEMORY, ABSTRACT, COUNTRY CHILDREN

Age	Boys		Girls	
	Number Cases	Average	Number Cases	Average
8	115	11.2	133	11.5
9	120	11.3	94	13.6
10	144	14.3	150	13.9
11	124	17.0	138	17.7
12	108	19.0	144	20.5
13	122	19.0	120	22.4
14	106	20.6	128	24.1
15	76	22.0	94	23.3
16	54	21.2	54	25.6
17	30	24.5	23	27.1
18	25	22.9	32	26.5

TABLE XXXVII—COMPARATIVE TABLE, CITY AND COUNTRY BOYS

Mental Measures

	Age	8	9	10	11	12	13	14	15	16	17	18
Substi-	City	7.9	10.0	11.8	13.4	15.4	16.8	19.2	22.1	23.7	26.4	24.4
tution	Country	6.0	7.7	9.2	12.4	14.6	17.3	19.8	20.5	21.2	22.4	25.5
Free	City	21.5	25.2	31.2	34.7	38.9	42.9	46.5	51.7	53.5	53.7	52.7
Association	Country	16.5	17.3	23.6	30.0	38.5	35.0	32.8	34.3	36.0	35.5	39.9
Rote Memory	City	17.4	19.7	20.8	22.0	23.3	24.1	24.8	25.4	25.6	26.7	27.1
Concrete	Country	13.4	14.8	18.3	21.0	21.8	22.2	22.4	24.6	24.4	26.5	25.8
Rote Memory	City	15.7	18.0	19.2	20.0	19.0	19.0	20.6	22.0	21.2	24.5	22.9
Abstract	Country	11.2	11.3	4.3	17.0	21.2	22.1	23.1	23.8	24.1	25.7	26.4
Opposites	City	10.8	13.4	16.7	16.6	17.2						
I	Country	4.9	6.4	8.2	9.9	9.8	11.0	11.7	12.6	13.5	14.9	15.2
Opposites	City			8.3	8.7	9.3	10.1	11.2	13.1	14.1	15.5	15.3
II	Country	3.8	3.5	5.1	5.7	5.6	6.8	7.1	7.2	9.8	10.5	11.0
Completion	City	10.6	12.1	13.7	13.5	13.2	13.1					
Joe and 4th	Country	4.4	5.5	6.9	8.0	8.4	9.8	11.4				

TABLE XXXVIII—COMPARATIVE TABLE, CITY AND COUNTRY GIRLS

Mental Measures

	Age	8	9	10	11	12	13	14	15	16	17	18
Substitu-	City	9.1	10.8	13.8	15.8	18.2	20.3	22.2	24.1	26.9	28.1	28.3
tution	Country	7.1	8.4	11.9	15.2	19.8	21.9	23.5	24.8	27.6	28.6	28.3
Free	City	24.5	28.9	35.4	40.3	45.0	49.7	53.5	54.4	59.1	59.5	58.2
Association	Country	21.2	22.1	27.1	32.2	36.6	34.0	36.4	36.2	46.4	45.6	42.9
Rote Memory	City	18.5	19.7	20.9	22.8	24.2	24.6	24.9	25.7	26.9	27.2	27.5
Concrete	Country	14.5	16.5	18.2	21.5	22.7	25.7	26.2	27.5	26.8	27.7	27.3
Rote Memory	City	17.1	18.4	19.6	21.0	22.5	23.3	23.6	24.6	25.7	25.8	27.1
Abstract	Country	11.5	13.6	13.9	17.7	20.5	22.4	24.1	23.3	25.6	27.1	26.5
Opposites	City	11.3	14.5	17.7	17.7	18.3						
I	Country	6.2	6.9	7.4	9.0	13.1	12.4	14.8	15.0	16.7	16.9	16.6
Opposites	City			7.4	8.5	10.1	11.0	12.2	14.6	16.6	19.2	17.7
II	Country	4.4	5.0	5.4	5.6	7.2	7.2	8.8	10.3	11.6	12.9	12.5
Completion	City	11.8	13.0	14.5	15.1	14.2	15.3					
Joe and 4th	Country	5.3	5.3	6.9	9.9	10.3	10.0	12.4				

TABLE XXXIX—MENTAL NORMS BY GRADES, CITY CHILDREN

Grade		Completion	Word Building	Free Assn.	Substitution	Rote Mem. Concrete	Rote Mem. Abstract	Logicall Memory	Analogues	Opposites
3	Boys	9.3	4.6	20.4	6.5	16.8	13.7	23.1	1.2	10.9
	Girls	10.4	5.1	23.7	6.8	15.6	14.3	23.6	2.2	11.5
4	Boys	13.0	6.1	28.4	9.8	18.7	17.3	29.2	2.8	16.3
	Girls	14.0	6.5	33.2	11.2	20.2	18.4	30.9	3.4	18.5
5	Boys	15.4	7.2	35.8	13.2	21.4	19.6	32.8	3.9	21.1
	Girls	16.5	7.6	39.7	14.6	21.6	19.7	34.8	5.2	21.3
6	Boys	14.3	9.3	41.9	14.4	23.0	20.7	28.7	6.8	7.4
	Girls	13.8	10.0	45.1	15.9	23.2	21.2	29.6	7.4	8.0
7	Boys	17.2	10.4	50.5	16.4	23.8	21.9	33.0	8.6	9.1
	Girls	16.9	11.2	51.6	19.5	24.1	22.8	29.9	8.9	9.8
8	Boys	18.8	11.3	49.8	20.6	24.7	23.0	34.2	10.4	11.0
	Girls	19.5	12.3	55.8	21.5	24.9	23.7	34.6	10.8	11.1
9	Boys	42.7	13.7	54.5	21.8	25.3	23.9	48.4	11.3	12.4
	Girls	42.5	14.6	58.8	22.0	25.0	24.0	50.8	11.4	15.4
10	Boys	41.3	13.8	58.0	24.5	25.8	24.3	50.6	13.0	17.6
	Girls	43.7	15.7	64.1	26.2	25.8	24.6	53.9	12.7	19.6
11	Boys	43.7	17.2	65.3	27.3	26.1	24.5	52.6	15.4	16.1
	Girls	45.7	15.2	66.7	28.6	26.8	25.7	54.9	14.6	19.4
12	Boys	44.0	16.5	63.1	28.2	27.0	25.0	52.4	15.0	15.9
	Girls	44.8	18.7	67.0	27.9	26.6	25.8	51.7	14.1	19.4

Completion test, grades 3, 4 and 5, *Joe and the Fourth of July;* grades 6, 7 and 8, *The Trout;* grades 9, 10, 11 and 12, *Dr. Goldsmith's Medicine.* Opposites I in grades 3, 4 and 5; II in grades above. Logical Memory, *Willie Jones* in grades 3, 4 and 5; *Farmer's Son* in 6, 7 and 8; *Costly Temper* in grades 9, 10, 11 and 12.

TEST MATERIAL FOR THE MENTAL TESTS

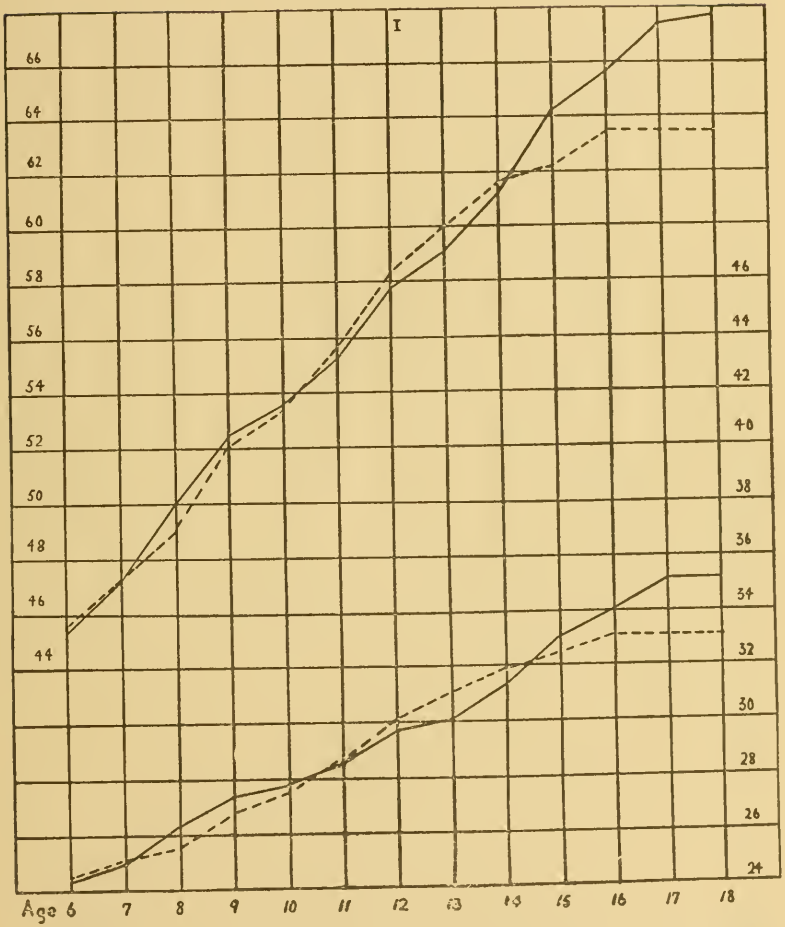
For Opposites: List I for grades three, four and five; list II, for grades six and above.

For Analogues, the Analogues Test Sheets.

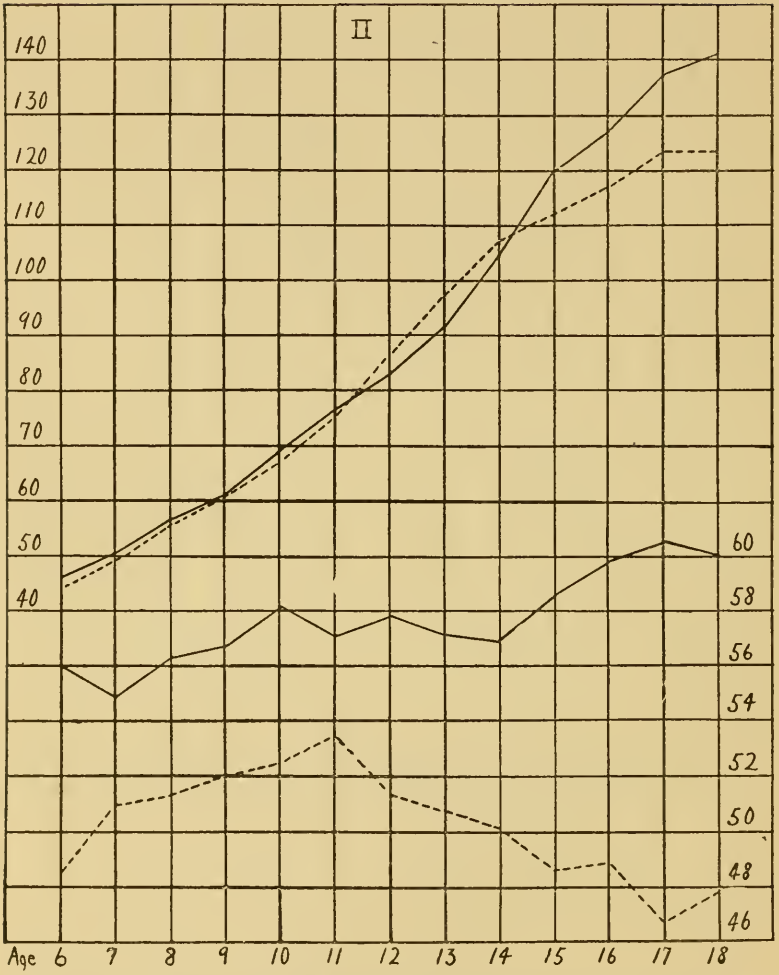
For Substitution, the Substitution Test Sheets.

For Completion, *Joe and the Fourth of July,* for grades three, four and five; *The Trout* for grades six, seven and eight; *Dr. Goldsmith's Medicine* for the high school.

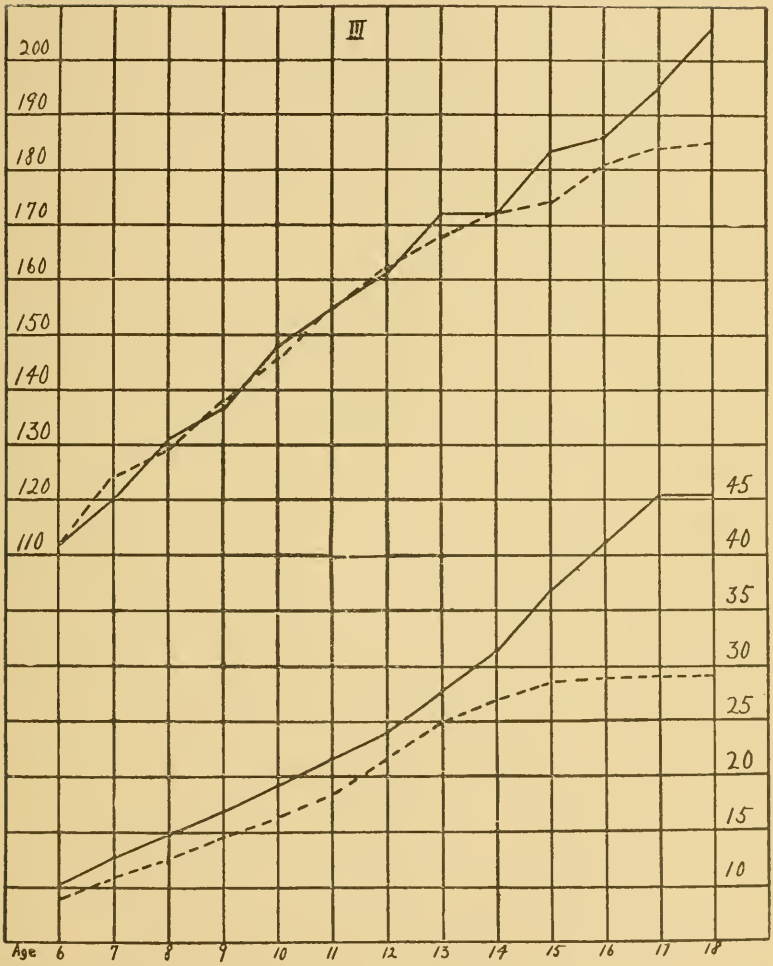
For the other tests no material is needed except writing paper.



I. Height in inches. Upper graphs, standing height; lower graphs, sitting height. Solid line, boys; broken line, girls.



II. Weight in pounds, upper graph; vital index, Cc. per Kg., lower graph. Solid line, boys; broken line, girls.



III. Tapping speed right hand, upper graphs; grip in Kg. right hand, lower graphs. Solid line, boys; broken line, girls.

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